Lower Lower Miocene Fan 1 (LM1 F1) Play

Lenticulina hanseni biozone

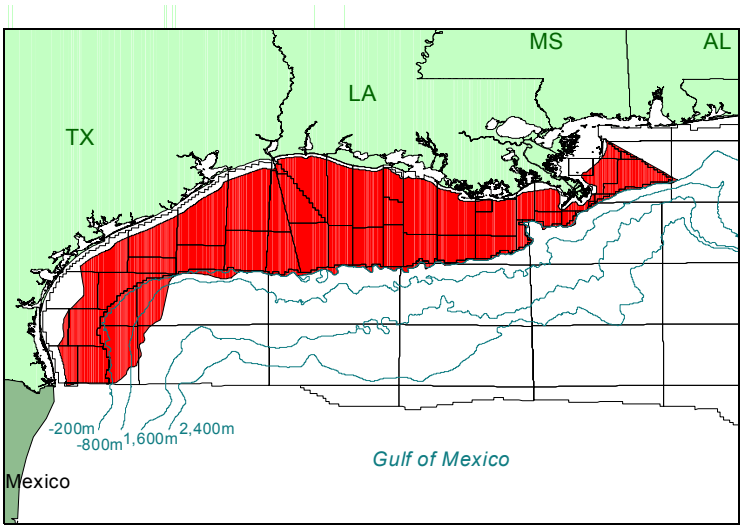

Figure 1. Play location.

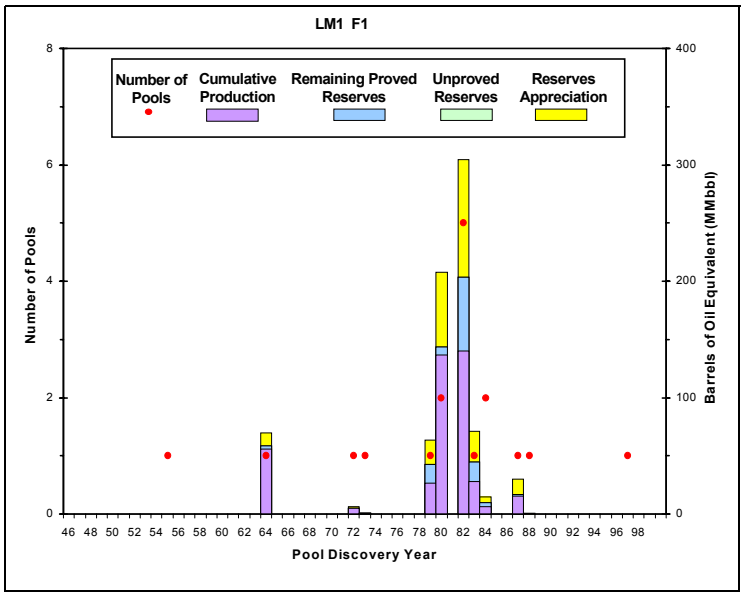

Figure 2. Exploration history graph showing reserves addition and number of pool discoveries by year.

LM1 F1 Play 18 Pools 52 Sands	Minimum	Mean	Maximum
Water depth (feet)	17	54	121
Subsea depth (feet)	11272	13990	18250
Number of sands per pool	1	3	8
Porosity	16%	23%	31%
Water saturation	16%	33%	50%

Table 1. Pool attributes. Values are volume-weighted averages of individual reservoir attributes.

Play Description

The established Lower Lower Miocene Fan 1 (LM1 F1) play occurs within the *Lenticulina hanseni* biozone. The play is also defined by deep-sea fan sediments in an extensional structural regime of of salt-withdrawal basins and extensive listric faulting located on the modern Gulf of Mexico Region shelf. The LM1 F1 play extends from the South Padre Island and Port Isabel Areas offshore Texas to the Viosca Knoll and Main Pass Areas east of the present-day Mississippi River Delta (figure 1).

Updip, the play continues onshore into Texas and Louisiana. To the southwest, the LM1 F1 play extends into Mexican national waters, while to the northeast, the play onlaps the Cretaceous carbonate slope. Downdip, the play is limited by the Lower Lower Miocene Fan 2 (LM1 F2) play.

Play Characteristics

The LM1 F1 play is characterized by deepwater turbidites deposited basinward of the LM1 shelf margin on the LM1 upper and lower slope, in topographically low areas between salt structure highs, and on the abyssal plain. Component depositional facies include channel/levee complexes, sheet-sand lobes, interlobes, lobe fringes, and slumps. These deep-sea fan systems are often overlain by thick shale intervals representative of sand bypass on the shelf, or sand-poor areas on the slope.

Most of fields in the LM1 F1 play are structurally associated with normal faults. Other less common trapping structures include growth faults with rollover anticlines, rotational slump blocks and shale diapir-like bodies with traps on the flanks of the shale or in sediment drape over the shale. Seals are provided by the

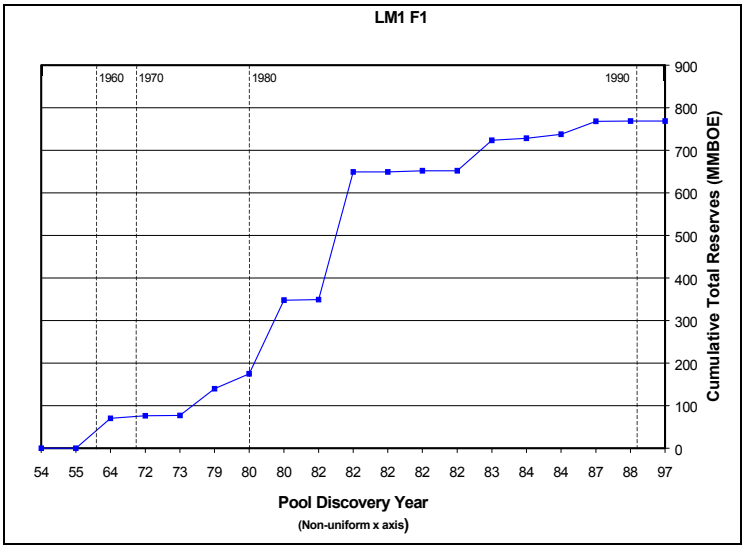

Figure 3. Plot of pools showing cumulative reserves by discovery order. Note the non-uniform x axis.

LM1 F1 Play Marginal Probability = 1.00	Number of Pools	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)
Reserves				
Original proved	18	0.021	2.831	0.525
Cumulative production	--	0.016	2.241	0.414
Remaining proved	--	0.005	0.590	0.110
Unproved	0	0.000	0.000	0.000
Appreciation (P & U)	--	0.010	1.319	0.244
Undiscovered Conventionally Recoverable Resources				
95th percentile	--	0.017	1.813	0.343
Mean	37	0.029	2.550	0.483
5th percentile	--	0.046	3.415	0.646
Total Endowment				
95th percentile	--	0.048	5.963	1.112
Mean	55	0.060	6.700	1.252
5th percentile	--	0.077	7.564	1.415

Table 2. Assessment results for reserves, undiscovered conventionally recoverable resources, and total endowment.

juxtaposition of reservoir sands with shales, either structurally (e.g., faulting) or stratigraphically (e.g., lateral shale-outs, overlying shales).

Discoveries

The LM1 F1 gas play contains total reserves of 0.031 Bbo and 4.150 Tcfg (0.769 BBOE), of which 0.016 Bbo and 2.241 Tcfg (0.414 BBOE) have been produced. The play contains 52 producible sands in 18 pools, all of which contain proved reserves (table 1; refer to the Methodology section for a discussion of reservoirs, sands, and pools). The first reserves in the play were discovered in the West Cameron 40 field in 1955 (figure 2). Pool discoveries were minimal until the 1980's when 10 out of the play's 18 pools were found. Maximum yearly total reserves of 304 MMBOE were added in 1982 with the discovery of five pools, including the largest pool in the play in the Matagorda Island 623 field (300 MMBOE). Almost all of the play's cumulative production and total reserves have come from pools discovered before 1990. The most recent discovery, prior to this study's cutoff date of January 1, 1999, was in 1997.

The 18 discovered pools contain 85 reservoirs, of which 82 are nonassociated gas and 3 are undersaturated oil. Cumulative production has consisted of 96 percent gas and 4 percent oil.

Assessment Results

The marginal probability of hydrocarbons for the LM1 F1 play is 1.00. The play contains a mean total endowment of 0.060 Bbo and 6.700 Tcfg (1.252 BBOE) (table 2). Thirty-three percent of this BOE mean total endowment has been produced.

Assessment results indicate that undiscovered conventionally recoverable resources (UCRR) have a range of 0.017 to 0.046 Bbo and 1.813 to 3.415 Tcfg at the 95th and 5th percentiles, respectively (figure 4). Mean UCRR are estimated at

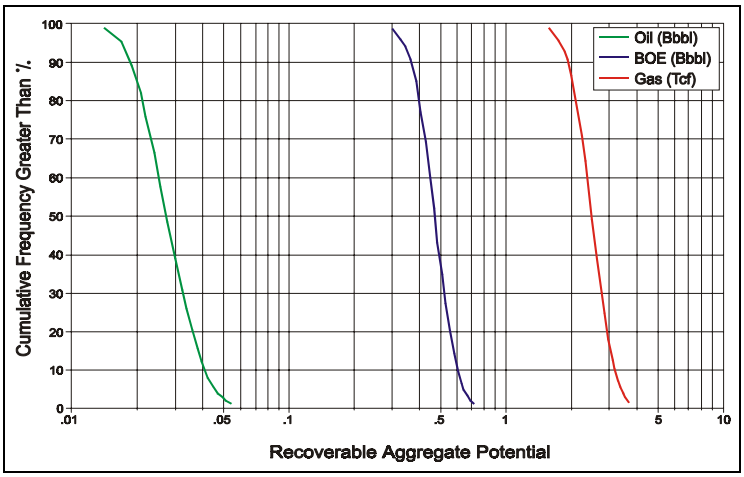

Figure 4. Cumulative probability distribution for undiscovered conventionally recoverable resources.

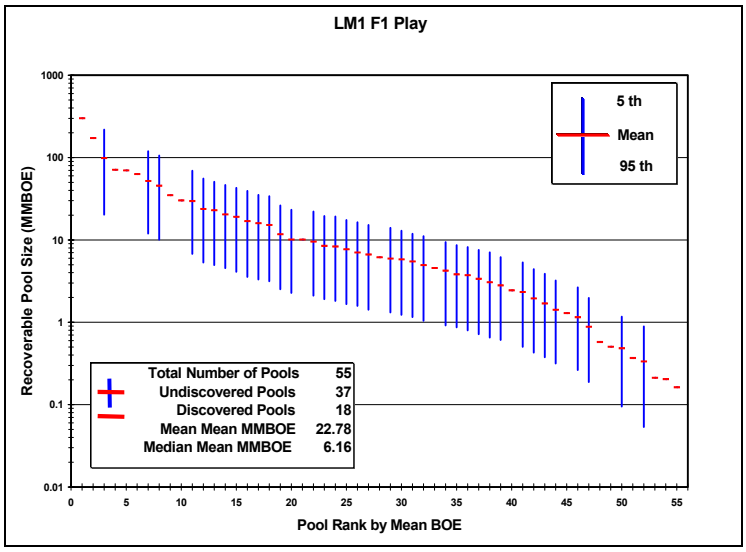

Figure 5. Pool rank plot showing the number of discovered pools (red lines) and the number of pools forecast as remaining to be discovered (blue bars).

0.029 Bbo and 2.550 Tcfg (0.483 BBOE). These undiscovered resources might occur in as many as 37 pools. The largest undiscovered pool, with a mean size of 99 MMBOE, is forecast to be the third largest pool in the play (figure 5). The forecast places the next four largest undiscovered pools in positions 7, 8, 11, and 12 on the pool rank plot. For all the undiscovered pools in the LM1 F1 play, the mean mean size is 13 MMBOE compared with the 43 MMBOE mean size of the discovered pools. The mean mean size for all pools, including both discovered and undiscovered, is 23 MMBOE.

BOE mean UCRR contribute 39 percent to the play's BOE mean total endowment. The greatest exploration potential lies deeper in, and downdip of, discovered fields where the LM1 section is deeply buried (table 2).